RCRA Corrective Action
Environmental Indicator (EI) RCRIS Code (CA725)
Current Human Exposures Under Control

Facility Name: **American Cyanamid Company**
Facility Address: **East Main Street, Bridgewater, New Jersey 08807**
Facility EPA ID#: **NJD002173276**

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EIs) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved) to track changes in the quality of the environment. The two EIs developed to date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no unacceptable human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all contamination subject to RCRA corrective action at or from the identified facility [i.e., site-wide]).

Relationship of EI to Final Remedies

While final remedies remain the long-term objectives of the RCRA Corrective Action program, the EIs are near-term objectives that are currently being used as program measures for the Government Performance and Results Act of 1993 (GPRA). The "Current Human Exposures Under Control" EI is for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and does not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI determination status codes should remain in the Resource Conservation and Recovery Information System (RCRIS) national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

Facility Information

The American Cyanamid company facility originally encompasses approximately 575 acres in north central New Jersey. (It is approximately 435 acres after the sale of the Hill Property.) The facility is located within the Bridgewater Township, Somerset County, and is bounded to the north by Main Street, to the south and west by the Raritan River and Foothill Road, and to the east by Interstate 287 and the Somerset Tire Service property. The surrounding area is predominantly urban, comprised of a mixture of

commercial, residential, and industrial districts. The facility borders the north bank of the Raritan River for nearly 1.5 miles, approximately 20 miles upstream of the river's discharge into the Atlantic Ocean.

Manufacturing operations began at the site in 1915. Numerous organic and inorganic chemicals and raw materials were used at the former American Cyanamid facility to produce a variety of chemical products, including dyes, pigments, elastomers (rubber-like products), pharmaceuticals, chemical intermediaries, and petroleum-based products. In December 1994, American Home Product (AHP) purchased the facility from American Cyanamid and assumed full responsibility for environmental remediation as required under an Administrative Consent Order (ACO) with the New Jersey Department of Environmental Protection (NJDEP). All manufacturing operations ceased in June 1999, and demolition of all Main Plant buildings was completed by November 2000. The facility has a current RCRA permit for waste consolidation and disposal operations at the recently constructed Impoundment 8 Facility. In 2002, Wyeth Holdings Corporation acquired AHP (including the American Cyanamid facility). For convenience, the facility name, American Cyanamid, will continue to be used in this document.

Environmental investigation and remediation has been in progress at the site since 1981. Most of the historical operations and associated contamination sources were confined to the Main Plant Production Area and West Yard. This area is bounded by railroad tracks to the north and south, Cuckolds Brook to the west, and the facility property line to the east. The Hill Property (north of and physically separated from the Main Plant Area but still a part of the overall facility has largely remained separate from Main Plant production operations, waste disposal activities, and contamination sources. The Hill Property was eventually delisted from CERCLA and sold in 1998. Twenty-seven on-site impoundments have been identified throughout the Main Plant Area for storage of waste byproducts, general plant waste, and demolition debris. The impoundments were constructed in native materials and are generally unlined, although some are underlain by natural pockets of silt and clay. Sixteen impoundments (Impoundments 1, 2, 3, 4, 5, 11, 13, 14, 15, 16, 17, 18, 19, 20, 24, and 26) are being addressed under CERCLA to eliminate potential contributions to observed groundwater contamination. Four impoundments (Impoundments 6, 7, 8, and 9A) are subject to closure and post-closure requirements under RCRA. The remaining seven impoundments were never used, contained only river silt from the facility's former river water treatment plant, contained only emergency fire water, or have already been closed with NJDEP approval.

A New Jersey Pollutant Discharge Elimination System-Discharge to Groundwater (NJPDES-DGW) permit was issued to the facility on September 30, 1987. Among other requirements, this permit requires groundwater monitoring on a quarterly basis, as well as continuous pumping from bedrock extraction wells at the main plant to contain groundwater contamination within the facility boundaries. In May 1988, the facility and NJDEP entered into an Administrative Consent Order (ACO) requiring investigation and remedial action for the sixteen CERCLA impoundments, site-wide contaminated soil, and groundwater. Groundwater extraction and monitoring requirements were incorporated into an amendment to the ACO in May 1994. In November 1988, EPA issued a Hazardous and Solid Waste Amendments (HSWA) Permit to the facility. This permit, in conjunction with the NJPDES-DGW permit issued by NJDEP in 1988, serves as the facility's RCRA permit. Through coordination between EPA and NJDEP, these permits and orders provided consistent direction for investigation, remediation, and closure of the RCRA and CERCLA impoundments, as well as utilization of the Impoundment 8 Facility for a RCRA Corrective Action Unit (CAMU) in the site-wide cleanup.

Impoundment closure activities are currently in progress. CERCLA Records of Decision (RODs) have been signed for active remediation of each of the impoundment groups, and a separate ROD was signed in July 1996 for no action at the Hill Property (except groundwater monitoring). The Hill Property site was determined to be clean when compared to the NJDEP soil cleanup criteria (both residential and non-residential). In the ROD for Impoundment Group III, Impoundment 8 was designated as a CAMU. This

designation allows for placement of residual waste from the Group III Impoundments into the Impoundment 8 Facility after appropriate treatment (e.g., solidification). The RODs for Groups I and II impoundments also involve placement of waste in the Impoundment 8 Facility. The Impoundment 8 Facility is currently operational.

The bedrock groundwater extraction system remains operational and recovered groundwater is discharged to the Somerset-Raritan Valley Sewerage Authority (SRVSA) wastewater facility for treatment. Site-wide groundwater monitoring is on-going. Hydrogeological data shows that extraction pumping has altered groundwater flow direction in both the overburden and bedrock aquifers, drawing contaminated groundwater towards the center of the site. The system also contains site-related contamination in overburden groundwater within the Main Plant Area. Overburden groundwater beneath the southernmost portions of the property does not appear to be influenced by the extraction well pumping system and, instead, flows toward the Raritan River. River water and sediment samples were collected in the early 1990s, and the results indicate that there were no significant site-related impacts to surface water quality.

A groundwater Classification Exception Area (CEA) and Well Restriction Area (WRA) has also been established for the site. These restrictions are intended to limit groundwater use within the facility boundaries and to provide public notification that residual contamination in groundwater remains above applicable New Jersey Groundwater Quality Criteria (NJ GWQC) for Class II-A aquifers.

The Main Plant portion of the site is completely surrounded by a chain-link fence. The wetlands/floodplain area south of the railroad tracks is not fenced, but is heavily vegetated and not easily accessible to off-site receptors. In addition, the facility has on-site security personnel that are present on site 24 hours a day, 7 days a week. The security personnel man the entrance gate to the facility and also perform routine patrols throughout the site to ensure trespassing does not occur. The facility also maintains a Master Health and Safety Plan which outlines all the precautions in place at the site and also requires notification to the on-site Environmental Manager before any work is performed.

Final remediation of site-wide soil and groundwater impacts will be addressed upon completion of planned surface impoundment source removal actions.

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from solid waste management units (SWMUs), regulated units (RUs), and areas of concern (AOCs)), been **considered** in this EI determination?

   _X_ If yes - check here and continue with #2 below.

   ___ If no - re-evaluate existing data, or

   ___ If data are not available skip to #6 and enter IN (more information needed) status code.

Summary of Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs): There are 27 surface impoundments at the American Cyanamid site. These SWMUs are listed in Table 1 below, and a facility site plan and surface impoundment map is located in the Impoundment Characterization Program Final Report (Ref. 2, Figure 2-1). Environmental activity at the American Cyanamid site is being conducted under both the RCRA and CERCLA programs. The following SWMU discussion is also separated out according to jurisdictional program. To further facilitate environmental action at American Cyanamid, the CERCLA surface impoundments have been separated into several groups according to waste type, nature of contaminants, and geographical location on the property. These groups are also noted in the discussion below.

Surface Impoundments Under RCRA Jurisdiction (SWMUs 6, 7, 8, and 9A): These four impoundments at the American Cyanamid site have been classified as RCRA Remediation Units (RUs). RCRA closure and post-closure requirements for these SWMUs are being implemented in accordance with the May 1994 ACO. Closure of Impoundments 6, 7, and 8 is being accomplished using the Impoundment 8 Facility as an appropriate on-site waste disposal location. Cell 1 of the disposal facility was constructed in May 1991. This portion of the unit was designed and constructed with a triple liner and leachate detection and collection system. Between August 1991 and November 1994, sludge from Impoundments 7, 19, and old Impoundment 8 was removed, dewatered, solidified, and consolidated in Cell 1. Construction of Cell 2 was completed in August 1996. A double composite liner and leachate detection and collection system is present in this cell. Waste from Impoundment 6 has been solidified and consolidated in Cell 2. Cells 3 and 4 were constructed in December 1999, similar to Cells 1 and 2, respectively. Waste from Impoundment 26 has been solidified and consolidated into Cells 3 and 4 (Ref. 16). A closure certification report was submitted for Impoundment 6 on September 16, 1999, and was approved by NJDEP on January 27, 2000 (Ref. 14). Certification of closure documentation has also been submitted for Impoundments 6 and 7 (Refs. 4, 8). NJDEP approved the closure certification for Lagoon 6 on January 27, 2000. Final closure of Lagoon 7 will occur upon final closure of the Impoundment 8 facility, as Lagoon 7 is currently used as a storm water surge basin (Ref. 7). Impoundment 9A has been closed in place by installing a double synthetic liner capping system (Ref. 1, 11).

Surface Impoundments Under CERCLA Jurisdiction: The CERCLA surface impoundments have been separated into three groups for environmental investigation and remediation. Remedial actions have been selected for each of the CERCLA impoundments to eliminate migration of contaminants into air, soil, groundwater, and surface water at the site. These impoundment groups and chosen remedies were discussed in detail in the Five-Year Review Report from September 1999 (Ref. 12), and are summarized in the following paragraphs.

Table 1 – Current Impoundment/SWMU Listing for the American Cyanamid Site (Ref. 2)

Impoundment/ SWMU	Acreage	Contents / Usage	Group / Status
1	2.1	Coal Tar Still Bottoms	CERCLA Group III
2	1.7	Coal Tar Still Bottoms	CERCLA Group III
3	1.0	Organic Residuals, General Plant Debris, Soil	CERCLA Group III
4	1.7	Organic Residuals, General Plant Debris	CERCLA Group III
5	7.0	Organic Residuals, General Plant Debris, Soil	CERCLA Group III
6	4.0	Compositing Basin for Plant Effluent Sludge	RCRA Group
7	17.0	Settling Lagoon for Plant Effluent Sludge	RCRA Group
8	8.0	Primary Sludge Lagoon with Single Liner	RCRA Group
9	4.0	Never Used	No Action
9A	4.1	Plant Effluent Sludge	RCRA Group
10	3.6	Never Used	No Action
11	2.8	Powerhouse Fly Ash	CERCLA Group I
12	2.0	Never Used	No Action
13	3.9	Lime and Secondary Sludge	CERCLA Group I
14	0.8	Organic Residuals	CERCLA Group III
15	2.6	Iron Oxide	CERCLA Group II
16	2.8	Iron Oxide	CERCLA Group II
17	6.0	Plant Effluent Sludge	CERCLA Group II
18	15.2	Plant Effluent Sludge	CERCLA Group II
19	1.8	Lime, Plant Effluent Sludge	CERCLA Group I
20	0.9	Plant Effluent Sludge	CERCLA Group III
21	2.1	Emergency Fire Water from River	No Action
22	1.6	River Silt from Former River Water Treatment Plant (filled to grade with clean soil)	No Action
23	3.9	River Silt Dredged from Impoundments 21 and 22	No Action
24	3.0	Lime and General Plant Debris	CERCLA Group I
25	0.2	Effluent Collection Basin for Plant Effluent (sludge removed and closed in 1988 with NJDEP approval)	No Further Action
26	0.9	Organic Residuals	CERCLA Group III

Group I Impoundments (SWMUs 11, 13, 19, and 24): A ROD was signed for these four on-site surface impoundments on September 28, 1993. Major components of the selected remedy include:

- Excavation of waste from the impoundments
- On-site solidification of excavated material
- Consolidation (disposal) of the solidified material in the RCRA-permitted Impoundment 8 Facility
- Groundwater monitoring to assess potential influences from Impoundments 19 and 24 on Raritan River water quality.

These actions are intended to eliminate migration of contaminants from the impoundments into air, soil, groundwater, and surface water at the site. To date, remedial activities have been completed at Impoundments 11 and 19. Solidified sludge from Impoundment 19 was placed in Cell 1, and solidified sludge from Impoundment 11 was placed in Cell 2 of the Impoundment 8 Facility. Work at Impoundments 13 and 24 will be initiated after remediation of the Group II and III impoundments (Refs. 5, 16).

Group II Impoundments (SWMUs 15, 16, 17, and 18): The ROD for these four surface impoundments was signed on July 12, 1996. Major components of the remedy include:

- Excavation of waste material from Impoundment 16 and consolidation (disposal) in Impoundment 15
- Placement of a synthetically lined cap over Impoundment 15
- Excavation/solidification of waste from Impoundment 17 and consolidation (disposal) at the Impoundment 8 Facility
- Construction of a security fence and berm improvements, and maintenance of natural vegetation at Impoundment 18
- Groundwater monitoring at Impoundments 15 and 18.

An Explanation of Significant Differences issued in November 1998 modified the remedy to include excavation of iron oxide material from both impoundments for off-site recycling. Recycling began in Spring 2000, and is expected to continue for a period of 20 years. Closure activities at Impoundment 18 have also been completed. Remediation of Impoundment 17 is expected to begin in 2008, after completion of work at the higher priority Group III Impoundments. These actions are intended to eliminate migration of contaminants from the impoundments into air, soil, groundwater, and surface water at the site (Refs. 9, 16).

Group III Impoundments (SWMUs 1, 2, 3, 4, 5, 14, 20, and 26): The ROD for these eight surface impoundments was signed on October 8, 1998. These SWMUs are the most contaminated and complex at the site. The Group III remedy addresses five different types of waste material found in the subject impoundments. Major components of the remedy include:

- Low temperature thermal treatment of high-BTU tar material in Impoundments 1 and 2, as well as remaining tar material in Impoundment 3
- Biotreatment of low-BTU tar in Impoundments 4, 5, 14, and 20
- Consolidation (disposal) of treated material at the Impoundment 8 Facility
- Excavation of nonhazardous waste in Impoundments 5 and 26, followed by placement in the Impoundment 8 Facility
- Excavation of general plant debris from Impoundments 3, 4, 5, 14, and 20, followed by consolidation (disposal) in the Impoundment 8 Facility.

In 2002, a 65,000 square foot processing structure was constructed to support the Group III impoundment remediation projects. Remedial design and pilot study efforts are in progress for the Group III Impoundments (Refs. 11, 16).

Surface Impoundments Requiring No Further Action (SWMUs 9, 10, 12, 21, 22, 23, and 25): These remaining seven impoundments at the American Cyanamid site require no further action. NJDEP has determined that the impoundments were never used, contained only river silt from the facility's former river water treatment plant, contained only emergency fire water, or have already been closed with regulatory approval (Refs. 5, 9, 11).

Hill Property: The Hill Property covers approximately 140 acres north of and physically separate from the Main Plant portion of the American Cyanamid site. A research laboratory and administrative buildings were located in this area. Following remedial investigation efforts in 1990, NJDEP determined that soil contaminant concentrations at the Hill Property were below background levels, Impact to Groundwater Criteria, and/or applicable NJDEP Soil Cleanup Criteria (both residential and non-residential). Consequently, no unacceptable current or future human health risks have been identified for soil at the Hill Property. During the same investigation, groundwater beneath the Hill Property was found to be impacted by many site-related contaminants (including benzene and chlorobenzene). Pumping of production wells formerly located at the Hill Property caused an overall northward flow of contaminated groundwater away from the Main Plant Area. To prevent flow of contaminants northward and potentially off site, the bedrock groundwater extraction wells were relocated from the Hill Property to the Main Plant in 1994. The northward groundwater flow direction has now been reversed. Impacted groundwater was drawn back southward toward the Main Plant Area, and observed site-related contaminant concentrations in the Hill Property wells began to decline. Current activity at the Hill Property includes monitoring of well PW-16 (Ref. 17). (The Hill Property was eventually delisted from CERCLA and sold in 1998.)

Previously Identified SWMUs: Environmental activities at the American Cyanamid site have focused on the surface impoundments noted above, but the facility's HSWA permit identified seven additional SWMUs at the former Cyanamid facility. Although identified as SWMUs in the 1988 HSWA permit, these areas do not have releases which warrant further action and the subsequent 1994 ACO Amendment SWMU listing included only the SWMUs requiring further action. Nevertheless, to provide a comprehensive picture of site conditions, these previously identified SWMUs are presented in Table 2 (Ref. 1).

Table 2 – Previously Identified SWMUs at the American Cyanamid Site (Ref. 1)

SWMU	Description	Status
28	Five Existing Underground Storage Tanks (N15T2, W16T10, W16T12, W16T13, and W16T4)	Removed and Closed in 1991 -1992
29	Two Existing Container Storage Areas (Site 109.3)	Closed and certified in April 2000
30	Tank Trucks Storage Area	Out of service
31	23 Former Hazardous Waste Storage Tanks	All Closed; Six Transferred to SRVSA
32	Secondary Sludge Incinerator	Transferred to SRVSA in January 1985; Closed in May 1985
33	Waste Piles from Sewer Cleaning	Removed
34	Three Former Container Storage Areas	Closed

In summary, a total of 27 impoundments were identified at the American Cyanamid site. Contamination at all 27 units has been delineated. Out of the 27 units, 16 were identified as potentially contributing to groundwater contamination and are being addressed under CERCLA. (These 16 Impoundments are: Impoundments 1, 2, 3, 4, 5, 11, 13, 14, 15, 16, 17, 18, 19, 20, 24, and 26.) The other 11 impoundments (Impoundments 6, 7, 8 [Old], 9, 9A, 10, 12, 21, 22, 23, and 25) were either never used (Impoundments 9, 10, 12), contain only river silt from the facility's former river water treatment plant (Impoundment 22 and 23), contain emergency fire water (Impoundment 21), have been closed with NJDEP approval (Impoundment 25), or have been addressed under RCRA closure plans (Impoundments 6, 7, 8 and 9A) (Refs. 11, 16). Of the 16 Impoundments being addressed under CERCLA, 4 have been closed (Impoundments 11, 18, 19, and 26) (Ref. 16). The remaining 12 Impoundments are currently being addressed in on-going remedial programs. In addition, the Impoundment 8 Facility (CAMU) has been constructed as a waste-consolidation facility for closure of the other on-site Impoundments (Ref. 16).

References:

RCRA Hazardous Waste Permit, Module II, American Cyanamid Company, Bound Brook, New Jersey. Prepared by USEPA, pursuant to the Hazardous and Solid Waste Amendments (HSWA). Dated November 1988.

Impoundment Characterization Program Final Report, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated January 1990 and Amended August 1990.

Underground Storage Tank Closure Report for Tanks West of Building 102, American Cyanamid Company, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated January 1992.

Letter from Joel Jerome, American Cyanamid, to Irene Kropp, NJDEP, re: Lagoon 7 Dredge Plan. Dated May 22, 1992.

Superfund Record of Decision, Group I Impoundments. Prepared by NJDEP. Dated September 1993.

Administrative Consent Order Amendment issued to the American Cyanamid Company, Bound Brook, New Jersey. Prepared by NJDEP. Dated May 5, 1994.

Letter from Patricia McDonald, AHP, to Haiyesh Shah, NJDEP, re: Impoundment 7 Closure Status Report. Dated December 22, 1994.

Letter from Patricia McDonald, AHP, to Haiyesh Shah, NJDEP, re: Lagoon 8 Closure Certification Report. Dated April 10, 1995.

9. Superfund Record of Decision, Group II Impoundments. Prepared by NJDEP. Dated July 1996.
10. Fact Sheet on the Superfund Proposed Plan, American Cyanamid Site, American Home Products Corporation, Bridgewater Township, New Jersey. Prepared by NJDEP. Dated April 1998.

Superfund Record of Decision for Group III Impoundments, American Cyanamid Site, American Home Products Corporation, Bridgewater Township, New Jersey. Prepared by NJDEP. Dated October 1998.

12. Five-Year Review Report, American Cyanamid Superfund Site, Bridgewater Township, New Jersey. Prepared by USEPA Region 2. Dated September 1999.
13. Letter from Jeff Catanarita, USEPA, to Haiyesh Shah, NJDEP, re: USEPA's Comments on American Cyanamid Certification Report on the Lagoon No. 6 Closure Program. Dated October 28, 1999.

Letter from Haiyesh Shah, NJDEP, to Thomas Donohue, AHP, re: American Cyanamid Site. Dated January 27, 2000.

Letter from Anthony Fontana, NJDEP, to Charles Neal, American Cyanamid Company, re: Closure of Hazardous Waste Container Storage Site 109.3. Dated April 5, 2000.

16. Superfund Site Update. Prepared by NJDEP. Dated December 2002.
17. Quarterly Groundwater Monitoring Report for the Second Quarter 2003, Wyeth Holdings Corporation, Bound Brook, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated July 2003.

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be "**contaminated**"[1] above appropriately protective risk-based levels (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

Media	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			VOCs, SVOCs, Inorganics
Air (indoors)[2]		X		
Surface Soil (e.g., <2 ft)		X		
Surface Water	X			VOCs, SVOCs, Inorganics
Sediment	X			SVOCs, Inorganics
Subsurface Soil (e.g., >2 ft)	X			VOCs, SVOCs, Inorganics, PCBs
Air (Outdoor)	X			VOCs

____ If no (for all media) - skip to #6, and enter YE, status code after providing or citing appropriate levels, and referencing sufficient supporting documentation demonstrating that these levels are not exceeded.

__X__ If yes (for any media) - continue after identifying key contaminants in each contaminated medium, citing appropriate levels (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

____ If unknown (for any media) - skip to #6 and enter IN status code.

Rationale:

Groundwater

The stratigraphy of the site is characterized by a thin layer of unconsolidated sediments, ranging from 5 to 30 feet (thickest in the southern portion of the site and thinnest to the north), overlying sedimentary bedrock units. Two primary aquifers have been identified at the site: overburden and bedrock. The overburden is comprised of two water transmitting units: one located in the man-made fill at the ground surface, and one in the deeper alluvial unit comprised of sand and gravel. Groundwater in the fill occurs approximately 6 to 18 inches below ground surface (bgs), while groundwater in the overburden is first encountered between 5 and 15 feet bgs, and slightly deeper (up to 20 feet below grade in the area of Lagoons 6 and 7) (Ref. 13). Overall, flow is downward from overburden to shallow bedrock due to continuous pumping of extraction wells (PW-2 and PW-3) in the Main Plant area (Ref. 6). South of the Lehigh-Reading Railroad tracks, bedrock pumping does not influence overburden flow, thus flow is southeast toward the Raritan River (Ref. 13). Groundwater within bedrock (Passaic Formation) is first encountered at depths ranging from approximately 20 to 65 feet below grade. Groundwater in bedrock

[1] "Contamination" and "contaminated" describe media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Department of Public Health and Environment, and others) suggests that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

predominantly flows through joints and fractures. For the past 60 years, groundwater in the Passaic Formation (bedrock) has been withdrawn in the American Cyanamid site area for use as non-contact cooling water in production operations. This pumping has, in turn, pulled contamination originally present in the overburden groundwater deeper, until the bedrock aquifer was also appreciably impacted. Extraction wells were originally located at the Hill Property, but were relocated to the Main Plant in March 1994, in order to avoid flow of contaminants into as yet unimpacted areas beneath the Hill Property (and potentially off site). Since 1994, bedrock groundwater flow in the northern half of the site has been moving radially inward toward the two extraction wells. Impacted bedrock groundwater beneath the Main Plant Area is also moving radially inward. Areas where groundwater is not migrating inward (e.g., the SS transmissive zone[3]) are not impacted. Bedrock groundwater at the Impoundment 8 Facility is discussed further below. Under natural flow conditions, the Raritan River would act as a local discharge point for bedrock groundwater in the Passaic Formation.

Hydrogeological characteristics beneath the Impoundment 8 Facility differ significantly from the overburden and bedrock aquifer descriptions discussed above. A groundwater interceptor trench and cut-off wall system was constructed as part of the unit to control overburden groundwater flow in the immediate area. This interceptor trench has been shown to be effective in controlling migration of overburden groundwater, as wells hydraulically downgradient of the system are consistently dry or nearly dry (Ref. 13). Rather than moving toward the Main Plant extraction wells, bedrock groundwater beneath the Impoundment 8 Facility flows southwest toward the Raritan River under natural conditions. However, a divergent flow pattern is observed in the immediate area when bedrock groundwater is pumped from a well located approximately 300 feet northeast of the Impoundment 8 Facility at the Phillips Concrete Incorporated site (formerly the Mensing Cement Company site). The influence of this extraction well causes a reversal of bedrock groundwater flow under the northern portion of the Impoundment 8 Facility toward the northeast (Ref. 13). Although this divergent flow pattern is not seen during every monitoring round, a dual set of downgradient wells is currently used to monitor for any leakage from the Impoundment 8 Facility under both flow patterns. The potential for dynamic influence and divergent flow is expected to remain until the Phillips/Mensing well is permanently shut down.

Since initiation of groundwater monitoring activities in 1982, a number of organic and inorganic constituents have been detected in overburden and bedrock groundwater beneath the American Cyanamid site. The following tables (Tables 3, 4, and 5) depict the maximum detected concentration in overburden, bedrock, and in shallow bedrock in the Impoundment 8 area during the 2nd Quarter 2003 monitoring event (Ref.. 13).

[3]The "SS transmissive zone," has been identified adjacent to the Raritan River. The SS transmissive zone is significantly deeper than, and does not appear to be hydraulically connected to, the highly and moderately transmissive zones. For more detailed information on subsurface hydrogeologic conditions at the site, please refer to the CA750 EI Determination.

Table 3 - Maximum Concentrations in Overburden Groundwater (µg/L) [sampled in April 2003 (Ref. 13)]

Well	Area	Constituent	Max. Conc.	NJ GWQC
MW-2	Impoundment 3, 4, 5 Area	Benzene	3,350	1
TFP-94-1R	Lagoon 6 and 7 / Impoundment 19 and 24 Area	Chlorobenzene	5,120	4
38-R	Lagoon 6 and 7 / Impoundment 19 and 24 Area	Chloroform	6.6	6
TFP-94-1R	Lagoon 6 and 7 / Impoundment 19 and 24 Area	1,2-dichlorobenzene	4,510	600
TFP-94-1R	Lagoon 6 and 7 / Impoundment 19 and 24 Area	1,4-dichlorobenzene	556	75
28-R	Impoundment 3, 4, 5 Area	1,2-dichloroethane	13.2	2
19-R	Impoundment 14	2,4-dimethylphenol	1,140	100
19-R	Impoundment 14	N-nitrosodiphenylamine (N-NDP)	419	20
MW-2	Impoundment 3, 4, 5 Area	Toluene	1,340	1,000
38-R	Lagoon 6 and 7 / Impoundment 19 and 24 Area	1,2,4-Trichlorobenzene	99.2	9
28-R	Impoundment 3, 4, 5 Area	Trichloroethene (TCE)	1.2	1
38-R	Lagoon 6 and 7 / Impoundment 19 and 24 Area	Xylene (total)	460	40
TFP-94-1R	Lagoon 6 and 7 / Impoundment 19 and 24 Area	Arsenic	122	8
16MW-2	Group II Area	Iron *	66,600	300
AAA	Group II Area	Manganese *	14,300	50

* This is not a RCRA hazardous constituent and is listed for informational purposes only.

Table 4 - Maximum Concentrations in Bedrock Groundwater (µg/L) [sampled in April 2003 (Ref. 13)]

Well	Area	Constituent	Max. Conc.	NJ GWQC
PW-3	Production Well	Benzene	1,110	1
PW-2	Production Well	Chlorobenzene	1,490	4
TT	Perimeter Bedrock Well	cis-1,2-dichloroethene	73	10
PW-3	Production Well	Nitrobenzene	57.6	10
TT	Perimeter Bedrock Well	Tetrachloroethene (PCE)	28.3	1
PW-2	Production Well	1,2,4-Trichlorobenzene	184	9
TT	Perimeter Bedrock Well	TCE	12.9	1

Table 5 - Maximum Concentrations in Groundwater at the Impoundment 8 Facility (µg/L) [sampled in April 2003 (Ref. 13)]

Well	Area	Constituent	Max. Conc.	NJ GWQC
RCRA-D15	Upgradient of Site	Carbon tetrachloride	14.6	2
RCRA-D15	Upgradient of Site	1,1-dichloroethene	6.9	2
RCRA-D15	Upgradient of Site	PCE	31.2	1
RCRA-D15	Upgradient of Site	TCE	5.9	1
RCRA-D5	Upgradient of Site	Aluminum *	1,260	50
RCRA-D8	Downgradient of Site	Iron *	6,370	300
RCRA-D9	Downgradient of Site	Manganese *	4,170	50
RCRA-D7	Downgradient of Site	Sodium *	101,000	50,000

* This is not a RCRA hazardous constituent and is listed for informational purposes only.

Indoor Air

Migration of volatile constituents is not a concern at this facility given that all buildings have been demolished and no structures currently exist at the site for occupancy. Shallow groundwater contamination is maintained within site boundaries, so there is no off-site concern for migration of volatile constituents into indoor air. Thus, indoor air is not considered an impacted medium at this site.

Surface and Subsurface Soil

Historical soil sampling has detected vast amounts of soil contamination at the American Cyanamid site. For development of planned remedial actions (on- and off-site treatment, waste consolidation for on-site placement, off-site recycling and off-site disposal), soil contamination was compared to NJDEP selected soil action levels. However, for purposes of this EI, soil contamination has been compared to the New Jersey Non-Residential Direct Contact Soil Cleanup Criteria (NJ NRDCSCC) to evaluate direct exposure to on-site industrial receptors, as the site is currently zoned and utilized for non-residential purposes.

Site-Wide Surface Soil: In December 1992, remedial action was performed to address all areas of surface soil impacted above the NJ NRDCSCC at the site that posed a potential risk to worker health and safety (Refs. 3, 4, 5, 11). Excavation and off-site disposal was performed for poly-chlorinated biphenyl (PCB)-contaminated surface soil exceeding the NJ NRDCSCC. Excavation and on-site disposal in Impoundment 8 CAMU was performed for PAH impacted surface soil above the NJ NRDCSCC. PAH impacted soil above the NJ NRDCSCC in the West Yard near Impoundment 14 was capped, along with placement of a geotextile, soil and vegetative cover over a chromium impacted surface soil area. This Surface Soil Remedial/Removal Action (SSR/RA) was performed as an interim measure to prevent worker exposure to contaminated surface soil. All areas (with the exception of the PAH-impacted Area 11, which was deemed clean based upon post-excavation samples) will be re-evaluated during the site-wide soil remediation program (Ref. 11). Thus, all impacted surface soil above the NJ NRDCSCC was either excavated and shipped off site for disposal, placed into the Impoundment 8 Facility, or capped.

Surface Impoundments Under RCRA Jurisdiction (6, 7, 8 [Old], 9A): Waste in Impoundments 6, 7, and 8 [Old] have been removed, solidified, and placed in the Impoundment 8 Facility (the constructed CAMU). Thus, no waste remains at this location above the NJ NRDCSCC. Impoundment 9A was closed in place by installing a double synthetic liner capping system (Ref. 11).

Group I Impoundments (11, 13, 19, and 24): Remediation of Group I Impoundments involve solidification and consolidation into the Impoundment 8 CAMU. Remediation of Impoundments 19 and 11 has been completed. Remediation of Impoundment 13 and 24 will be initiated after completion of the remediation at the Group II and III Impoundments. Completion of the remedy is planned for 2008 (Refs. 3, 11).

Impoundment 13: The following contaminants are present in subsurface soil above NJ NRDCSCC: N-NDP (610 mg/kg[4], NJ NRDCSCC = 600 mg/kg), benzo(a)anthracene (170 mg/kg, NJ NRDCSCC = 4 mg/kg), benzo(k)fluoranthene (8.7 mg/kg, NJ NRDCSCC = 4 mg/kg), naphthalene (9,300 mg/kg, NJ NRDCSCC = 4,200 mg/kg), PCB-1248 (3.4 mg/kg, NJ NRDCSCC = 2.0 mg/kg), PCB-1254 (7.6 mg/kg, NJ NRDCSCC = 2.0 mg/kg), arsenic (58.10 mg/kg, NJ NRDCSCC = 20 mg/kg), chromium (978 mg/kg, NJ NRDCSCC = 20 mg/kg), lead (13,100 mg/kg, NJ NRDCSCC = 600 mg/kg), copper (3,520 mg/kg, NJ NRDCSCC = 600 mg/kg), and zinc (2,440 mg/kg, NJ NRDCSCC = 1,500 mg/kg) (Ref. 3).

Impoundment 24: The following contaminants are present in subsurface soil above NJ NRDCSCC: N-NDP (1,200 mg/kg, NJ NRDCSCC = 600 mg/kg), naphthalene (8,800 mg/kg, NJ NRDCSCC = 4,200 mg/kg), PCB-1254 (9.8 mg/kg, NJ NRDCSCC = 2.0 mg/kg), arsenic (169 mg/kg, NJ NRDCSCC = 20 mg/kg), chromium (671 mg/kg, NJ NRDCSCC = 20 mg/kg), lead (1,270 mg/kg, NJ NRDCSCC = 600 mg/kg), copper (2,920 mg/kg, NJ NRDCSCC = 600 mg/kg), and zinc (1,970 mg/kg, NJ NRDCSCC = 1,500 mg/kg) (Ref. 3).

Group II Impoundments (15, 16, 17, and 18): Remediation of Group II Impoundments involves recycling and reuse of the iron oxide material in Impoundments 15 and 16, which began in Spring 2000. Closure activities have been completed at Impoundment 18 and involve security fencing, berm improvements, and maintenance of natural vegetative cover. Remediation of Impoundment 17 involves excavation/solidification and placement into the Impoundment 8 Facility, which will begin upon completion of the remedy at the Group III Impoundments (Refs. 4, 11).

Impoundment 15: The following contaminants are present in subsurface soil above NJ NRDCSCC: PCBs (3.0 mg/kg, NJ NRDCSCC = 2.0 mg/kg), arsenic (79.80 mg/kg, NJ NRDCSCC = 20 mg/kg), and copper (4,490 mg/kg, NJ NRDCSCC = 600 mg/kg) (Ref. 4).

Impoundment 16: The following contaminants are present in subsurface soil above NJ NRDCSCC: PCBs (6.2 mg/kg, NJ NRDCSCC = 2.0 mg/kg), arsenic (63.6 mg/kg, NJ NRDCSCC = 20 mg/kg), beryllium (7.9 mg/kg, NJ NRDCSCC = 1.0 mg/kg), and copper (2,620 mg/kg, NJ NRDCSCC = 600 mg/kg) (Ref. 4).

Impoundment 17: The following contaminants are present in subsurface soil above NJ NRDCSCC: benzo(a)anthracene (41.0 mg/kg, NJ NRDCSCC = 4 mg/kg), PCBs (15.0 mg/kg, NJ NRDCSCC = 2 mg/kg), arsenic (166 mg/kg, NJ NRDCSCC = 20 mg/kg), beryllium (2.2 mg/kg, NJ NRDCSCC = 1 mg/kg), chromium (19,700 mg/kg, NJ NRDCSCC = 20 mg/kg), copper (3,640 mg/kg, NJ NRDCSCC = 20 mg/kg), lead (3,070 mg/kg, NJ NRDCSCC = 600 mg/kg), and zinc (3,750 mg/kg, NJ NRDCSCC = 1,500 mg/kg) (Ref. 4).

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[4]All concentrations presented are the maximum detected concentration for the particular contaminant

Impoundment 18: The following contaminants are present in subsurface soil above NJ NRDCSCC: benzo(a)anthracene (66 mg/kg, NJ NRDCSCC = 4 mg/kg), PCBs (3.9 mg/kg, NJ NRDCSCC = 2 mg/kg), arsenic (522 mg/kg, NJ NRDCSCC = 20 mg/kg), beryllium (1.8 mg/kg, NJ NRDCSCC = 1 mg/kg), chromium (2,600 mg/kg, NJ NRDCSCC = 20 mg/kg), copper (3,670 mg/kg, NJ NRDCSCC = 600 mg/kg), lead (3,320 mg/kg, NJ NRDCSCC = 600 mg/kg), and zinc (4,380 mg/kg, NJ NRDCSCC = 1,500 mg/kg) (Ref. 4).

Group III Impoundments (1, 2, 3, 4, 5, 14, 20, and 26): The Group III Impoundments include the most heavily contaminated areas at the site. Remediation of Group III Impoundments includes Low-Temperature Thermal Treatment, Bio-Treatment of impacted material in Impoundments 1, 2, 3, 4, 5, 14, and 20 and consolidation of material into the Impoundment 8 Facility. Excavation of non-hazardous wastes from Impoundments 5 and 26 is planned, followed by placement of materials into the Impoundment 8 Facility (Ref. 11). The detected predominant constituents are as follows: benzene, toluene, xylenes, naphthalene, nitrobenzene, 1,2-dichlorobenzene, N-NDP, and 2-methylnaphthalene. The specific contaminants detected above NJ NRDCSCC are identified below for each impoundment in Group III (Refs. 5, 11).

Impoundment 1: The following contaminants are present in subsurface soil above NJ NRDCSCC: benzene (270,000 mg/kg, NJ NRDCSCC = 13 mg/kg), toluene (66,0000 mg/kg, NJ NRDCSCC = 1,000 mg/kg), xylenes (10,000 mg/kg, NJ NRDCSCC = 1,000 mg/kg), naphthalene (6,500 mg/kg, NJ NRDCSCC = 4,200 mg/kg), nitrobenzene (1,500 mg/kg, NJ NRDCSCC = 520 mg/kg), and PCBs (5.2 mg/kg, NJ NRDCSCC = 2 mg/kg) (Ref. 5).

Impoundment 2: The following contaminants are present in subsurface soil above NJ NRDCSCC: benzene (87,000 mg/kg, NJ NRDCSCC = 13 mg/kg), toluene (22,000 mg/kg, NJ NRDCSCC = 1,000 mg/kg), xylenes (2,400 mg/kg, NJ NRDCSCC = 1,000 mg/kg), naphthalene (11,000 mg/kg, NJ NRDCSCC = 4,200 mg/kg), PCBs (3.5 mg/kg, NJ NRDCSCC = 2 mg/kg), and arsenic (24.40 mg/kg, NJ NRDCSCC = 20 mg/kg) (Ref. 5).

Impoundment 3: The following contaminants are present in subsurface soil above NJ NRDCSCC: benzene (1,000 mg/kg, NJ NRDCSCC = 13 mg/kg), benzo(a)anthracene (9.7 mg/kg, NJ NRDCSCC = 4 mg/kg), PCBs (5.4 mg/kg, NJ NRDCSCC = 2 mg/kg), and lead (4,980 mg/kg, NJ NRDCSCC = 600 mg/kg) (Ref. 5).

Impoundment 4: The following contaminants are present in subsurface soil above NJ NRDCSCC: benzene (20,000 mg/kg, NJ NRDCSCC = 13 mg/kg), toluene (8,100 mg/kg, NJ NRDCSCC = 1,000 mg/kg), xylenes (3,500 mg/kg, NJ NRDCSCC = 1,000 mg/kg), 2,4-dinitrotoluene (4,200 mg/kg, NJ NRDCSCC = 4 mg/kg), 2,6-dinitrotoluene (22,000 mg/kg, NJ NRDCSCC = 4 mg/kg), nitrobenzene (1,300 mg/kg, NJ NRDCSCC = 520 mg/kg), naphthalene (20,000 mg/kg, NJ NRDCSCC = 4,200 mg/kg), and arsenic (101 mg/kg, NJ NRDCSCC = 20 mg/kg) (Ref. 5).

Impoundment 5: The following contaminants are present in subsurface soil above NJ NRDCSCC: methylene chloride (630 mg/kg, NJ NRDCSCC = 210 mg/kg), acetone (5,500 mg/kg, NJ NRDCSCC = 1,000 mg/kg), 1,2-dichloroethane (110 mg/kg, NJ NRDCSCC = 24 mg/kg), benzene (82,000 mg/kg, NJ NRDCSCC = 13 mg/kg), chloroform (26,000 mg/kg, NJ NRDCSCC = 28 mg/kg), toluene (35,000 mg/kg, NJ NRDCSCC = 1,000 mg/kg), xylenes (28,000 mg/kg , NJ NRDCSCC = 1,000 mg/kg), 2,4-dinitrotoluene (22 mg/kg, NJ NRDCSCC = 4 mg/kg), nitrobenzene (54,000 mg/kg, NJ NRDCSCC = 520 mg/kg), benzo(a)anthracene (200 mg/kg, NJ NRDCSCC = 4 mg/kg), naphthalene (420,000 mg/kg, NJ NRDCSCC = 4,200 mg/kg),

N-NDP (14,000 mg/kg, NJ NRDCSCC = 600 mg/kg), PCBs (79 mg/kg [Aroclor 1242], NJ NRDCSCC = 2 mg/kg), arsenic (63.1 mg/kg, NJ NRDCSCC = 20 mg/kg), barium (7,480 mg/kg, NJ NRDCSCC = 47,000 mg/kg), beryllium (1.6 mg/kg, NJ NRDCSCC = 1 mg/kg), chromium (3,680 mg/kg, NJ NRDCSCC = 20 mg/kg), copper (3,020 mg/kg, NJ NRDCSCC = 600 mg/kg), lead (2,930 mg/kg, NJ NRDCSCC = 600 mg/kg), and zinc (3,190 mg/kg, NJ NRDCSCC = 1,500 mg/kg) (Ref. 5).

Impoundment 14: The following contaminants are present in subsurface soil above NJ NRDCSCC: benzene (1,300 mg/kg, NJ NRDCSCC = 13 mg/kg), chlorobenzene (3,200 mg/kg, NJ NRDCSCC = 680 mg/kg), toluene (1,300 mg/kg, NJ NRDCSCC = 1,000 mg/kg), xylenes (1,400 mg/kg, NJ NRDCSCC = 1,000 mg/kg), nitrobenzene (1,600 mg/kg, NJ NRDCSCC = 1,500 mg/kg), benzo(a)anthracene (200 mg/kg, NJ NRDCSCC = 4 mg/kg), 2-chlorophenol (10,000 mg/kg, NJ NRDCSCC = 5,200 mg/kg), naphthalene (7,800 mg/kg, NJ NRDCSCC = 4,200 mg/kg), arsenic (101 mg/kg, NJ NRDCSCC = 20 mg/kg), and copper (730 mg/kg, NJ NRDCSCC = 600 mg/kg) (Ref. 5).

Impoundment 20: The following contaminants are present in subsurface soil above NJ NRDCSCC: benzene (5,500 mg/kg, NJ NRDCSCC = 13 mg/kg), chlorobenzene (3,000 mg/kg, NJ NRDCSCC = 680 mg/kg), xylenes (2,900 mg/kg, NJ NRDCSCC = 1,000 mg/kg), antimony (663 mg/kg, NJ NRDCSCC = 340 mg/kg), beryllium (1.36 mg/kg, NJ NRDCSCC = 1 mg/kg), chromium (58,400 mg/kg, NJ NRDCSCC = 20 mg/kg), copper (8,270 mg/kg, NJ NRDCSCC = 600 mg/kg), lead (1,880 mg/kg, NJ NRDCSCC = 600 mg/kg), and zinc (148,000 mg/kg, NJ NRDCSCC = 1,500 mg/kg) (Ref. 5).

Impoundment 26: The following contaminants are present in subsurface soil above NJ NRDCSCC: benzene (330 mg/kg, NJ NRDCSCC = 13 mg/kg), toluene (1,400 mg/kg, NJ NRDCSCC = 1,000 mg/kg), benzo(a)anthracene (660 mg/kg, NJ NRDCSCC = 4 mg/kg), n-nitrosodiphenylamine (450 mg/kg, NJ NRDCSCC = 600 mg/kg), PCB Aroclor 1254 (5.7 mg/kg, NJ NRDCSCC = 2 mg/kg), arsenic (43.90 mg/kg, NJ NRDCSCC = 20 mg/kg), copper (5,290 mg/kg, NJ NRDCSCC = 600 mg/kg), lead (38,200 mg/kg, NJ NRDCSCC = 600 mg/kg), and zinc (5,820 mg/kg, NJ NRDCSCC = 1,500 mg/kg) (Ref. 5).

Surface Water/Sediment

Raritan River

The southern property boundaries of the American Cyanamid site border the north bank of the Raritan River for approximately 1.5 miles, approximately 20 miles upstream from the river's discharge to the Atlantic Ocean (Ref. 2). Tidal influences are not observed in the vicinity of the site (Ref. 1). The land use along the Raritan River is primarily urban/suburban and the river is reported to be impacted by various point and non-point sources and run-off. Four surface water and sediment samples were collected in the Raritan River as part of the 1996 Natural Resource Assessment and the 2000 Surface Water and Sediment Sampling effort (Refs. 10, 14). One upstream sample was also collected from the Raritan River. American Cyanamid compared available surface water data to New Jersey Surface Water Quality Criteria (NJ SWQC), where available. National Ambient Water Quality Criteria (NAWQC) and Region 3 (R3) Risk-Based Concentrations (RBC) for tap water were used when NJ SWQC were not available. Based upon sample results, the following contaminants of concern (COC) were identified in surface water: chromium (11 µg/L, R3 RBC Tap Water = 11 µg/L), iron (2,620 µg/L, NAWQC Water +Organism = 300 µg/L), lead (5.7 µg/L, NJ SWQC = 5.7 µg/L), naphthalene (0.70 µg/L, R3 Tap Water RBC = 0.65 µg/L), benzene (10 µg/L, NJ SWQC = 0.15 µg/L), bromodichloromethane (6.1 µg/L, NJ SWQC = 0.27 µg/L), and chloroform (8.8 µg/L, NJ SWQC = 5.670). The following COC were identified in sediment based upon recreational exposure: arsenic (90 mg/kg, NJ NRDCSCC = 20 mg/kg),

copper (1,430 mg/kg, NJ NRDCSCC = 600 mg/kg), iron (597,000 mg/kg, NJ NRDCSCC = 122,640 mg/kg), and benzo(a)anthracene (5.1 mg/kg, NJ NRDCSCC = 4.0 mg/kg). Manganese (322 µg/L, NAWQC Organism Only = 100 µg/L) was the only contaminant of concern identified in surface water relative to fish ingestion.

Cuckolds Brook

Cuckolds Brook is a tributary to the Raritan River. The brook originates north of the site, flows through the site, and discharges to the Raritan River at the Calco Dispersion Dam. Cuckolds Brook is classified as a FW2-NT (freshwater, non-trout[5]) stream according to the NJ Surface Water Quality Standards (Ref. 2). Cuckolds Brook is subject to approximately 12 million gallons per day (mgd) to 21 mgd (dry weather flow) discharge effluent from the SRVSA, located immediately west of Impoundments 4 and 26. This is a NPDES-permitted discharge for metals and organic constituents and accounts for a majority of the surface water flow in Cuckolds Brook. Seven surface water and sediment samples were collected in Cuckolds Brook as part of the 1996 Natural Resource Assessment and the 2000 Surface Water and Sediment Sampling effort (Refs. 10, 14). Two samples were collected from upstream locations in Cuckolds Brook. Although contaminant concentrations have been detected above relevant screening criteria in Cuckolds Brook, available documentation indicates that the impacts to the Brook are likely due to the permitted discharge from the SRVSA. Thus, contaminant concentrations in Cuckolds Brook are not being considered as impacts relative to the American Cyanamid facility (Refs. 10, 14). Therefore, Cuckolds Brook will not be discussed further in this EI determination.

Wetlands/Floodplain

The floodplain/wetlands area includes the banks of both the Cuckolds Brook and Raritan River, and the portion of the facility south of the railroad tracks. A total of 32 sediment and 12 surface water samples were collected in the wetlands/floodplain area south of the Lehigh-Reading Railroad tracks as part of the 1996 Natural Resource Assessment and the 2000 Surface Water and Sediment Sampling effort (Refs. 10, 14). Twelve of the sediment samples were collected to analyze arsenic only. The following constituents were identified as COC in surface water: aluminum (23,600 µg/L, R3 Tap Water RBC = 3,650 µg/L), arsenic (15 µg/L, NJ SWQC = 0.017 µg/L), chromium (37 µg/L, R3 Tap Water RBC = 11 µg/L), copper (244 µg/L, R3 Tap Water RBC = 146 µg/L), iron (27,900 µg/L, NAWQC = 00 µg/L), lead (136 µg/L, NJ SWQC = 5.0 µg/L), manganese (5,630 µg/L, NAWQC = 50 µg/L), mercury (0.74 µg/L, NJ SWQC = 0.14 µg/L), vanadium (50.3 µg/L, R3 Tap Water RBC = 25.55 µg/L), 2-methyphenol (1.5 µg/L, NJ SWQC = 0.39 µg/L), and benzene (195 µg/L, NJ SWQC = 0.15 µg/L). Sediment data was compared to the NJ NRDCSCC, given that direct exposure to on-site industrial receptors is the exposure pathway of concern. The following constituents were identified as COC in sediment in the wetlands/floodplains area: arsenic (74 mg/kg, NJ NRDCSCC = 20 mg/kg), beryllium (3.1 mg/kg, NJ NRDCSCC = 2.0 mg/kg), chromium (23,200 mg/kg, NJ NRDCSCC = 613 mg/kg), copper (3,820 mg/kg, NJ NRDCSCC = 600 mg/kg), iron (353,000 mg/kg, NJ NRDCSCC = 122,640 mg/kg), lead (1,330 mg/kg, NJ NRDCSCC = 600 mg/kg), benzo(a)anthracene (23 mg/kg, NJ NRDCSCC = 4.0 mg/kg), benzo(a)pyrene (4.1 mg/kg, NJ NRDCSCC = 0.66 mg/kg), and benzo(b)fluoranthene (5.2 mg/kg, NJ NRDCSCC = 4.0 mg/kg).

Outdoor Air

During the Baseline Endangerment Assessment, a quantitative risk analysis was performed for all potential current and future exposure pathways to contaminants on site. All impoundments were evaluated to determine the potential for exposure of contaminants into outdoor air. Based upon the results, only Impoundments 1 and 2 were determined to present a concern with regards to migration of volatile contaminants into outdoor air (Refs. 3, 4, 5). These two impoundments contained the highest volatile concentrations detected in impoundments on site. In addition, potential for contaminant

[5] A freshwater body not capable of supporting trout populations

migration to outdoor air at the remaining impoundments was not a concern because many impoundments have been covered with various material (e.g., solidified material, fill, water, and soil/vegetation) to prevent the migration of volatiles and/or particulates into outdoor air (Refs. 3, 4, 5). Thus, a potential for outdoor air impacts is possible at the site in the vicinity of Impoundments 1 and 2 only.

References:

1. Soils Remedial Investigation Report and Feasibility Study Work Plan (including the Hydrogeological Investigation Program Report as Attachment 3), American Cyanamid Company, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated October 1990 and Amended May 1992.
2. Baseline Site-Wide Endangerment Assessment, American Cyanamid Company, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated December 1990 and Amended March 1992.
3. Superfund Record of Decision, Group I Impoundments. Prepared by NJDEP. Dated September 1993.
4. Superfund Record of Decision, Group II Impoundments. Prepared by NJDEP. Dated July 1996.
5. Superfund Record of Decision, Group III Impoundments. Prepared by NJDEP. Dated October 1998.
6. Letter from Angelo Caracciolo, O'Brien & Gere Engineers, to Haiyesh Shah, NJDEP, re: Historic Aniline Spill Assessment. Dated January 26, 1999.
Superfund Site Update for the American Cyanamid Site, AHP, Bridgewater Township, New Jersey. Prepared by NJDEP. Dated September 1999.
8. Case Information Report on the CEA and WRA, AHP, Bound Brook, New Jersey. Prepared by NJDEP. Dated June 8, 2000.
9. Baseline Ecological Evaluation/Problem Formulation Document, American Cyanamid Company, Madison, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated January 2002.
10. Human Health Risk Assessment Exposure Pathway Analysis Report, American Cyanamid Company, Madison, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated January 2002.
11. Superfund Site Update. Prepared by NJDEP. December 2002.
12. Quarterly Groundwater Monitoring Report for the First Quarter 2003, Wyeth Holdings Corporation, Bound Brook, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated April 2003.
13. Quarterly Groundwater Monitoring Report for the Second Quarter 2003, Wyeth Holdings Corporation, Bound Brook, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated July 2003.
14. Human Health Risk Assessment. Prepared by O'Brien & Gere Engineers, Inc. Dated August 2003.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table
*Potential **Human Receptors** (Under Current Conditions)*

"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespasser	Recreation	Food[6]
Groundwater	No	No	No	Yes	–	–	No
~~Air (indoor)~~							
~~Surface Soil (e.g., < 2 ft)~~							
Surface Water	Yes	No	–	Yes	Yes	Yes	Yes
Sediment	Yes	No	–	Yes	Yes	No	Yes
Subsurface Soil (e.g., > 2 ft)	–	–	–	Yes	–	–	No
Air (outdoors)	Yes	No	No	Yes	Yes	–	–

Instruction for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated" as identified in #2 above.

2. Enter "yes" or "no" for potential "completeness" under each "Contaminated" Media Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations, some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces. These spaces instead have dashes ("–"). While these combinations may not be probable in most situations, they may be possible in some settings and should be added as necessary.

___ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

_X_ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

___ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale:

[6] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish)

Groundwater

As mentioned in the response to Question No. 2, overburden and shallow bedrock groundwater flow direction varies across the American Cyanamid site due to several factors. Since 1994, bedrock groundwater flow in the northern half of the site has been moving radially inward toward the two extraction wells. Groundwater flow between the Main Plant Area and the Hill Property has been reversed and now moves south-southwest toward the new extraction wells (Ref. 5). Pump tests have shown significant hydraulic connection between the overburden and bedrock groundwater zones and Main Plant extraction wells PW-2 and PW-3 (Ref. 14). The zone of influence created by extraction well pumping encompasses the Main Plant portion of the site and is elongated to the east and west based on the presence and orientation of the highly and moderately transmissive zones. According to several studies performed at the American Cyanamid site, and approved by NJDEP, the current groundwater pumping system maintains hydraulic control over the majority of impacted bedrock groundwater and ninety percent of impacted overburden groundwater (Refs. 7, 8, 14). Unimpacted groundwater south of the railroad tracks in the southeastern corner of the site is not affected by extraction well pumping from wells PW-2 and PW-3 (Ref. 5) and continues to flow to the Raritan River, a regional groundwater discharge zone.

Overburden groundwater in the Impoundment 8 Facility is controlled by an interceptor trench and cut-off wall system. Bedrock groundwater beneath the Impoundment 8 Facility generally flows toward and into the Raritan River. Impacts of contaminated groundwater discharge on the Raritan River are discussed in the surface water sections of this EI determination.

Thus, based upon all available information, the potential for off-site receptors to be exposed to impacted groundwater beneath the facility is not considered a potentially complete exposure pathway as extraction wells at the facility are maintaining hydraulic control over 90 percent of the impacted groundwater at the facility. The remainder of the impacted groundwater is either discharging to the Raritan River, or being captured by the Impoundment 8 Facility cut-off wall and interceptor trench system. Impacts of groundwater discharge to the Raritan River are discussed further in the surface water sections of this EI.

In addition to active pumping of contaminated groundwater, the facility has established a CEA and WRA for groundwater in the site area (Ref. 11). The CEA and WRA specifically address Passaic (bedrock) groundwater to a depth of 80 feet beneath the Main Plant and West Yard areas and the Hill Property. The CEA provides notice to the public agencies and the public that groundwater in this area is impacted above NJ GWQC. In addition, the well restriction area provides notice that potable wells should not be placed within the area of impact. The CEA and WRA were established in July 1996 and will remain in effect until residual groundwater contamination has been sufficiently recovered by pumping at the Main Plant and/or naturally degrades to concentrations below applicable standards. Given the establishment of the CEA and WRA for the site, and given that groundwater is not currently used for potable purposes at this inactive facility, there is no concern for on-site receptor exposure to groundwater at the site via potable uses.

A well survey conducted in November 1989 searched for an inventory of wells within two miles of the site. A number of wells were identified, most for domestic use with relatively low yields. Industrial wells and a locally owned public water supply well field were also identified. Although the report notes that many of the wells were installed in the 1950s and 1960s and may no longer be in use, data on actual usage status of private wells in the American Cyanamid site area were not collected at that time. However, in completing pump tests for the relocation of the on-site extraction wells, American Cyanamid determined that many of the wells were hydraulically isolated from contaminants at the site (Ref. 3). Furthermore, according to an internal NJDEP letter dated September 22, 1994, the only two domestic wells in the vicinity of the site were being monitored in 1994, with no detected groundwater

contamination (Ref. 6). The letter also noted that the local community is being served by a public water (Elizabethtown Water Supply) supply which withdraws water from the Raritan River upstream of the American Cyanamid site. However, it should be noted that the Human Health Risk Assessment (HHRA) Report indicates that there are two municipal raw water intakes, the first (Elizabethtown) intake is located upstream of the Calco dispersion dam and upstream of a majority of the impacted areas at the site. The second intake is located approximately eight miles downstream of the site. The well survey and 1992 pump tests also indicated that most of the industrial and local government wells maintained pumping rates considered negligible as far as impacting groundwater flow and containment at the facility. In addition, no private wells have been identified within the CEA boundaries; therefore, well withdrawal of impacted groundwater is under control.

There is a potential for construction worker (e.g., remedial worker) exposure to overburden groundwater, given that overburden groundwater can be encountered at 5 to 15 feet bgs. Thus, exposure for on-site construction workers (e..g, remedial workers) to impacted overburden groundwater is being considered a potentially complete exposure pathway.

Subsurface Soil

As previously mentioned, all impacted surface soil[7] has been remediated at the site. All subsurface soil contamination been delineated and is maintained within facility boundaries. The site is currently inactive. The only activities currently being performed on site are associated with the remediation of contamination identified at the facility. Thus, construction workers (e.g., remedial workers) are the only potential receptors of concern and may potentially become exposed to subsurface contamination while conducting remedial activities at the site. Security personnel and maintenance workers are present at the site (Refs. 12, 15).

Surface Water and Sediment

Raritan River
The Raritan River is used as the primary supply for residential water by the Elizabethtown Water Company. The raw water intake point is located on the north bank of the river, upstream of most of the plant area, but downstream of the western portion of the facility that extends to the Raritan River. A second intake was identified in the HHRA Report and is located approximately eight miles downstream of the site. Primary contact recreation (swimming) is not allowed in the area of the facility due to elevated fecal coliform levels (Refs. 12, 15). (The elevated fecal coliform level is not specifically attributed to the American Cyanamid facility.) Secondary contact recreation (boating, fishing) occurs in the area of the facility as there are no fish advisories. Recreational exposure to sediment is not considered a complete exposure pathway given that receptors are not expected to be wading in the river in the area of the facility due to the elevated fecal coliform levels. Thus, residents (potable water consumption), recreators (contact with surface water, ingestion of fish), and construction workers (dermal contact and ingestion of surface water/sediment and air) have been identified as having potentially complete exposure pathways to impacted surface water in the Raritan River.

Floodplains/Wetlands
The floodplains/wetlands area is densely vegetated making it extremely difficult to access for off-site recreators (Refs. 12, 15). According to the HHRA Exposure Pathway Assessment Report, this area has been accessed by trespassers (teenagers and young adults) using off-road vehicles. However, the HHRA Exposure Pathways Assessment Report indicates that additional security measures have been

[7]Note that wetlands/flooplain soil samples have been classified as sediment for the purposes of this EI Determination. Thus, potential trespasser exposure to wetlands/floodplain soil is discussed in the "sediment" subsection.

implemented since completion of the BEA, which have reduced the frequency of trespasser access to this area (Ref. 15). In addition, the dense vegetation and remoteness from residential neighborhoods makes access for young children to the area extremely difficult and unlikely (Ref. 15). Given that access to this area of the site is possible for trespassers, exposure to surface water and sediment in the floodplains/wetland area is being considered potentially complete exposure pathway for purposes of conservativeness within this EI determination. Construction workers (e.g., remedial workers, security patrol personnel, and maintenance workers) could also become exposed to impacted surface water and sediment (e.g., wetlands soil) within the floodplains area while conducting remedial activities.

Outdoor Air

Based upon the results presented in the Baseline Endangerment Assessment (Ref. 2) and the ROD for Group III SWMUs (Refs. 2, 9), there is a potential for volatile emissions to migrate from Impoundments 1 and 2 at elevated levels. Thus, there is a potential for on-site construction workers (e.g., remedial workers) to be exposed to contaminant concentrations in outdoor air. The Baseline Endangerment Assessment also indicated a potential for off-site receptor exposure volatile contaminants emanating from Impoundments 1 and 2, thus tresspassers and off-site residents have been included as potential receptors to off-site outdoor air impacts.

References:

Soils Remedial Investigation Report and Feasibility Study Work Plan (including the Hydrogeological Investigation Program Report as Attachment 3), American Cyanamid Company, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated October 1990 and Amended May 1992.

Baseline Site-Wide Endangerment Assessment, American Cyanamid Company, Bound Brook, New Jersey. Prepared by Blasland, Bouck & Lee. Dated December 1990 and Amended March 1992.

Relocation of Production (Extraction) Well Pump Test Report, American Cyanamid Company, Bound Brook, New Jersey. Prepared by Camp, Dresser & McKee Inc. Dated June 1992.

Relocation of Production Well Groundwater Modeling Report American Cyanamid Company, Bound Brook, New Jersey. Prepared by Camp, Dresser & McKee Inc. Dated October 1992.

Summary Report on Start-Up of Production (Extraction) Wells PW-2 and PW-3, American Cyanamid Company, Bound Brook, New Jersey. Prepared by Camp, Dresser & McKee Inc. Dated August 23, 1994.

6. Letter from Bruce Venner, NJDEP, to David Sweeney, NJDEP. Re: Technical Support Assignment for the American Cyanamid Site. Dated September 22, 1994.
7. Letter from Haiyesh Shah, NJDEP, to Patricia McDonald, AHP, re: AHP/American Cyanamid Site. Dated July 15, 1996.
8. Letter from Steven Roland, O'Brien & Gere Engineers, Inc., to Anthony Matarazzo, Elizabethtown Water Company, re: Raritan River Assessment. Dated May 22, 1998.
9. Superfund Record of Decision, Group III Impoundments. Prepared by NJDEP. Dated October 1998.
10. Case Information Report on the CEA and WRA, AHP, Bound Brook, New Jersey. Prepared by NJDEP. Dated June 8, 2000.
11. Baseline Ecological Evaluation/Problem Formulation Document, American Cyanamid Company, Madison, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated January 2002.
12. Human Health Risk Assessment Exposure Pathway Analysis Report, American Cyanamid Company, Madison, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated January 2002.

13. Quarterly Groundwater Monitoring Report for the First Quarter 2003, AHP Corporation, Bound Brook, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated April 2003.
14. Quarterly Groundwater Monitoring Report for the Second Quarter 2003, Wyeth Holdings Corporation, Bound Brook, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated July 2003.
15. Human Health Risk Assessment. Prepared by O'Brien & Gere Engineers, Inc. Dated August 2003.

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **significant**[8] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks?

_X_ If no (exposures cannot be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale:

Groundwater

As discussed in response to Question No. 3, the potential for on-site construction workers (e.g., remedial workers) to come in direct contact with contaminated groundwater is being considered a potentially complete exposure pathway. All shallow groundwater contamination (less than 10 feet bgs) is currently identified within property boundaries; thus, intrusive activities conducted in this area are limited to remedial work. Remedial workers are expected to perform work under health and safety plans following strict Occupational Health and Safety Administration (OSHA) guidelines. Personal protective equipment (PPE) would be used during any intrusive activities in this area of the site, thus minimizing the potential for direct exposure to impacted groundwater. In addition, no work can be conducted at the site without authorization by the Environmental Manager. Therefore, any potential exposures that may occur for on-site construction workers (e.g., remedial workers) are not expected to be significant (Refs. 2, 4, 5).

Subsurface Soil

As discussed in response to Question No. 3, the potential for on-site construction workers (e.g., remedial workers) to come in direct contact with contaminated subsurface soil at the site is being considered a potentially complete exposure pathway. All residual soil contamination is located within property boundaries. Thus, intrusive activities conducted in this area would be limited to remedial work. As mentioned above, remedial workers are expected to perform work under health and safety plans following strict OSHA guidelines. PPE would be used during any remedial activities in this area of the site, thereby minimizing the potential for direct exposure to impacted soil. In addition, no work can be conducted at the site without authorization by the Environmental Manager. Therefore, any potential

[8] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a Human Health Risk Assessment Specialist with appropriate education, training and experience.

exposures that may occur for on-site construction workers (e.g., remedial workers) are not expected to be significant (Refs. 2, 4, 5).

Surface Water and Sediment

Construction Worker (e.g., Remedial Worker and Security Patrol) - Raritan River and Wetlands/Floodplains

As discussed in response to Question No. 3, the potential for on-site construction workers (e.g., remedial workers) to come in direct contact with contaminated surface water and sediment (e.g., wetland soil) at the site is being considered a potentially complete exposure pathway. On-site construction workers (e.g., remedial workers) may come in contact within impacted wetlands/floodplain surface water and sediment within property boundaries, and impacted surface water and sediment in the Raritan River adjacent to the site. As mentioned above, remedial workers are expected to perform work under health and safety plans following strict OSHA guidelines. PPE would be used during any remedial activities in this area of the site, thereby minimizing the potential for direct exposure to impacted soil. Security workers perform visual inspections and generally do not leave their vehicles to patrol on foot. In addition, they wear a uniform (e.g., long pants, shoes) and are OSHA certified (Refs. 2, 4, 5). Therefore, any potential exposures that may occur for on-site construction workers (e.g., remedial workers and security patrol) are not expected to be significant.

Construction Worker (e.g., Maintenance Worker) - Wetlands/Floodplains

The HHRA Report indicates that maintenance workers (e.g., on-site maintenance) may be exposed to site-related constituents within the wetlands/floodplain area during security fence and vegetation maintenance near the impoundments. However, the likelihood for routine, long-term exposure for these receptors to site-related contaminants is unlikely and exposure are not expected to be significant. To support this determination, risk calculations were performed in the HHRA Report to estimate risks and hazards for an on-site maintenance worker to impacted media in the wetlands/floodplain area. Calculated excess lifetime cancer risks (ELCR) for a construction worker were as follows: soil = 8.4E-7, surface water = 3.2E-8, and outdoor air = 6.5E-8. The calculated Reasonable Maximum Exposure (RME) Hazard Index (HI) for non-cancer risks is 0.7, also below the EPA threshold of 1.0. Thus, all risks are calculated to be below the EPA acceptable risk range of 1.0E-4 to 1.0E-6 and hazards are below the EPA threshold, thus confirming that risks and hazards are not likely to be significant (Refs. 2, 4, 5).

Trespasser - Wetlands/Floodplains

The HHRA Report evaluated possible adolescent trespasser exposure to contamination in the wetlands/floodplains area, given that trespassing had been observed in this area in the past. However, as mentioned previously, since the BEA additional security measures have been implemented at the site and trespassing has not been observed. Thus, trespasser exposure to impacted surface water and sediment in the wetlands/floodplain area is not expected to be significant. To support this determination, risk calculations were performed in the HHRA Report to estimate risks and hazards for an adolescent trespasser to impacted media in the wetlands/floodplain area. Calculated ELCRs were as follows: sediment (e.g., wetland soil) = 1.3E-5, surface water = 2.4E-8, and outdoor air = 1.5E-7. The calculated RME HI for non-cancer risks is 7.2, which is above the EPA threshold of 1.0. However, potential exposure to chromium by dermal contact with soils is the primary contaminant of concern. The calculation of this RME HI assumes that chromium is present in its most toxic form (chromium VI). Thus, the HHRA Report indicates that risk to this contaminant is likely overestimated (Ref. 4). In addition, as mentioned previously, additional measures have been taken since the BEA to prevent trespassing and no trespassing has been observed. Thus, given that all risks are calculated to be within or below the EPA acceptable risk range of 1.0E-4 to 1.0E-6, hazards are likely overestimated due to the use of chromium VI for risk calculation, and given that additional precautions were taken to prevent

trespassing–trespasser exposure to impacted media in wetlands floodplains is not expected to pose significant risk (Refs. 2, 4, 5).

Residents - Raritan River

The HHRA Report indicates that recreators (both adult and child) may be exposed to site-related constituents in potable water collected from the Raritan River. As previously mentioned, there are two intakes of concern. The first (Elizabethtown) is located upstream of the Calco dispersion dam. Surface water sample RR-6 was used to calculate risks and hazards for this intake point (See Figure 1-3, Ref. 5). The second intake is approximately eight miles downstream of the site. Surface water samples collected adjacent to the site (RR-3, R-4, RR-6 and RR-8) were used to calculate risks and hazards for this intake point (See Figure 1-3, Ref. 5). However, it is likely that contaminant concentrations detected at the facility boundary would be significantly reduced at the actual potable intake points. Risk calculations were performed in the HHRA Report to estimate risks and hazards for an adult and child resident exposure to potable water collected from the Raritan River. Calculated ELCR were as follows: adult = 7.1E-8 (Elizabethtown intake) and 6.5E-7 (downstream intake), child = 1.1E-7 (Elizabethtown intake) and 1.2E-7 (downstream intake). Thus, all risks are calculated to be below the EPA acceptable risk range of 1.0E-4 to 1.0E-6 and are not expected to be significant. The calculated RME HI for non-cancer risks is 0.4 (Elizabethtown intake) and 1.1 (downstream intake) for adults and 0.6 (Elizabethtown intake) and 2.0 (downstream intake) for children. The calculated HIs for the Elizabethtown intake are both below the EPA threshold, while the calculated HIs for downstream intake are slightly above the threshold. Iron and manganese, which are not hazardous constituents, are the two primary constituents contributing to the elevated HI value. These constituents are natural elements that are ubiquitous in the environment. In addition, it is highly unlikely that the concentrations used to calculate the HI will be present at the intake point eight miles downstream. Significant dilution would occur to reduce those maximum detected concentrations along the American Cyanamid boundary as they travel downstream to the intake point. In addition, all water collected from the Raritan River and utilized for potable purposes (e.g., community water supply) are routinely monitored and treated to ensure that contaminants are not present in the water that is distributed to local residents. Thus, given the nature of contaminants, the natural dilution that will occur in the Raritan River, and the routine monitoring/treatment that would take place prior to potable use, risks to off-site residents from potable water collected in the Raritan River are not expected to be significant (Refs. 2, 4, 5).

Recreator - Raritan River

The HHRA Report indicates that recreators (both adult and child) may be exposed to site-related constituents within the surface water in the Raritan River. However, the likelihood for routine, long-term exposure by these receptors to site-related contaminants is unlikely and exposures are not expected to be significant. To support this determination, risk calculations were performed in the HHRA Report to estimate risks and hazards for a recreator to impacted surface water in the Raritan River. Calculated excess lifetime cancer risks (ELCR) were as follows: adult = 9.3E-8, child = 3.5E-8. The calculated RME HI for non-cancer risks is 0.02 for adults and 0.04 for children, both below the EPA threshold of 1.0. Thus, all risks are calculated to be below the EPA acceptable risk range of 1.0E-4 to 1.0E-6 and hazards are below the EPA threshold, thus confirming that risks and hazards are not likely to be significant. Risks and hazards were not calculated for exposure to impacted fish caught from the Raritan River, given that only one contaminant of concern (manganese, which is not a hazardous constituent) was identified for fish and this contaminant is a natural element that is ubiquitous in the environment and not likely to bioaccumulate through the food chain. Thus, impacts on fish in the Raritan River are not expected to be significant and therefore human exposure via ingestion of fish captured from the Raritan River in the vicinity of the site is not identified as a concern (Refs. 2, 4, 5).

Outdoor Air

As discussed in Question No. 3, there is a potential for volatile migration of contaminants to outdoor air from Impoundments 1 and 2. Impoundments 1 and 2 are located within the Main Plant, thus remedial workers are present in the area. However, remedial workers are expected to perform work under health and safety plans following strict OSHA guidelines. American Cyanamid's Master Site Health and Safety Plan includes provisions to conduct routine ambient air monitoring when remedial activities are being performed at the site (Ref. 4). PPE would also be used during any activities in this area of the site, thus minimizing the potential for direct exposure to elevated contaminant concentrations in outdoor air (Ref. 4).
The Baseline Endangerment Assessment indicated that volatile emissions from Impoundments 1 and 2 posed a potential risk to off-site receptors. The potential cancer risk associated with emissions from Impoundment 1 and 2 for off-site receptors was calculated to be 2.4E-6, which is within the USEPA acceptable risk range of 1.0E-4 to 1.0E-6. Thus, risks are not expected to be significant (Ref. 1).

In addition, there is a water cover over Impoundment 2 and a synthetic liner has been installed over Impoundment 1 to control volatile emissions (Ref. 1). In 2002, to further control outdoor air impacts, a 65,000 square foot process structure was built to support the Group III Remediation project. The structure, which includes an extensive air handling and treatment system, was built to control odors and air emissions generated during the processing of impoundment materials (Ref. 3). Thus, based upon current available information, potential exposure for on- and off-site receptors to volatile contaminants in outdoor air is not expected to be significant.

References:

1. Superfund Record of Decision, Group III Impoundments. Prepared by NJDEP. Dated October 1998.
2. Human Health Risk Assessment Exposure Pathway Analysis Report, American Cyanamid Company, Madison, New Jersey. Prepared by O'Brien & Gere Engineers, Inc. Dated January 2002.
3. Superfund Site Update. Prepared by NJDEP. December 2002.
4. American Cyanamid Company, Bound Brook Site, Master Health and Safety Plan. January 15, 2003.
5. Human Health Risk Assessment. Prepared by O'Brien & Gere Engineers, Inc. Dated August 2003.

5. Can the "significant" **exposures** (identified in #4) be shown to be within acceptable limits?

____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale:

This question is not applicable. See response to question #4.

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI (Event Code CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

_X_ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI determination, "Current Human Exposures" are expected to be "Under Control" at the American Cyanamid site, East Main Street, Bridgewater, New Jersey, under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

___ NO - "Current Human Exposures" are NOT "Under Control."

___ IN - More information is needed to make a determination

Completed by: _____ Date: _____

Kristin McKenney
Risk Assessor
Booz Allen Hamilton

Reviewed by: _____ Date: _____

Kathy Rogovin
Senior Risk Assessor
Booz Allen Hamilton

Also Reviewed by: _____ Date: 9-17-03

Clifford Ng, Remedial Project Manager
RCRA Programs Branch
USEPA Region 2

_____ Date: 9/17/03

Barry Tornick, Section Chief
RCRA Programs Branch
USEPA Region 2

Approved by: _____ Date: 9/26/03

Adolph Everett, Acting Chief
RCRA Programs Branch
USEPA Region 2

Locations where references may be found:

References reviewed to prepare this EI determination are identified after each response. Reference materials are available at the EPA Region 2, RCRA Records Center, located at 290 Broadway, 15th Floor, New York, New York, and the New Jersey Department of Environmental Protection Office located at 401 East State Street, Records Center, 6th Floor, Trenton, New Jersey.

Contact telephone and e-mail numbers: Clifford Ng, USEPA RPM
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ng.clifford@epa.gov

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

Attachments

The following attachments have been provided to support this EI determination.

Attachment 1 - Summary of Media Impacts Table

Attachment 1 - Summary of Media Impacts Table

American Cyanamid Company,
East Main Street, Bridgewater, New Jersey

Impoundment/ SWMU	GW[1]	AIR (Indoors)	SURFACE SOIL	SURFACE WATER	SEDIMENT	SUBSURFACE SOIL	AIR (Outdoors)	CORRECTIVE ACTION MEASURE[2]	KEY CONTAMINANTS
SWMUs 6, 7, 8 and 9A (RCRA Jurisdiction)	NA	No	No	No	No	No	No	Excavation, dewatering, solidification, and proper consolidation of waste materials in impoundments Closure documentation submitted	NA
Group I Impoundments (SWMUs 11, 13, 19, and 24)	NA	No	No	Yes	Yes	Yes	No	Excavation of wastes from impoundments On-site solidification of excavated material Consolidation into Impoundment 8 Facility Groundwater monitoring (19, 24) (see below)	VOCs, SVOCs, Inorganics, PCBs
Group II Impoundments (SWMUs 15, 16, 17, 18)	NA	No	No	Yes	Yes	Yes	No	Excavation (16. 17) and consolidation of material (15, 8) Capping (15) Fence, berm improvements, maintenance of natural vegetation (18) Groundwater monitoring (15, 18) (see below)	VOCs, SVOCs, Inorganics, PCBs
Group III Impoundments (SWMUs 1, 2, 3, 4, 5, 14, 20, and 26)	NA	No	No	Yes	Yes	Yes	No	Thermal treatment of tar material (1, 2, 3) Biotreatment of tar (4, 5, 14, 20) Consolidation of treated material (8) Excavation of non-hazardous materials (5, 26) and consolidation (8) Excavation of plant debris (3, 4, 5, 14, 20) and consolidation (8)	VOCs, SVOCs, Inorganics, PCBs

Impoundment/ SWMU	GW[1]	AIR (Indoors)	SURFACE SOIL	SURFACE WATER	SEDIMENT	SUBSURFACE SOIL	AIR (Outdoors)	CORRECTIVE ACTION MEASURE[2]	KEY CONTAMINANTS
Hill Property	Yes	No	No	No	No	No	No	Groundwater monitoring at PW-16	None
Overburden Groundwater	Yes	NA	NA	Yes	Yes	NA	NA	Active groundwater recovery within the bedrock aquifer controls contamination in overburden On-going groundwater monitoring program in place Interceptor trench and cut-off wall in place to control overburden groundwater flow near the Impoundment 8 Facility Source removal actions underway at specific impoundments	Benzene Chlorobenzene 1,2,4-trichlorobenzene 1,2-dichlorobenzene 1,4-dichlorobenzene 2,4-dimethylphenol N-NDP Xylene Arsenic
Bedrock Groundwater	Yes	NA	NA	NA	NA	NA	NA	CEA and WRA established in 1996 for the entire site and Hill Property; to remain in place until constituents have dropped below applicable NJ GWQC Active groundwater recovery within the Main Plant Area since 1994 to contain impacted groundwater beneath the site On-going quarterly groundwater monitoring program in place Source removal actions underway at specific impoundments	Benzene Chlorobenzene TCE PCE 1,2,4-trichlorobenzene Cis-1,2-DCE Nitrobenzene Arsenic Manganese

1 For purposes of this table, groundwater has been presented on a site-wide basis given that impacts to groundwater are due to the numerous sources present at the site. In addition, corrective measures have been selected to address site-wide groundwater contamination

2 Numbers in parentheses represent the SWMU/Impoundment number